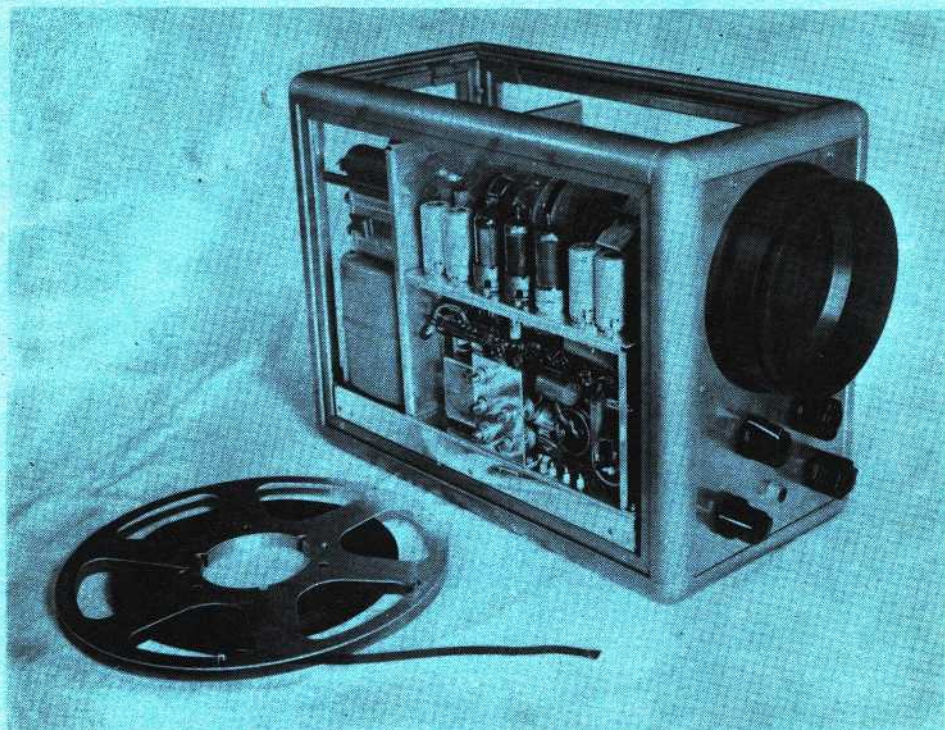


17/16



cq-tv

4 2

Published for the British Amateur Television Club
at 20, Hughenden Road, Bristol 8.

Editor: J.E.Tanner, G5NDT/T,
20, Hughenden Road,
Bristol 8.



Club Officers:

Chairman. C.G.Dixon, Kyrle's Cross, Peterstow,
Ross-on-Wye.
Hon. Secretary. D.S.Reid, 149, Ongar Road,
Brentwood, Essex.
Hon Treasurer. L.A.F.Stockley, G5EKE,
121 Hollingwood Lane, Bradford 7.
Editor, CQ-TV. J.E.Tanner, G5NDT/T,
20 Hughenden Road, Bristol 8.

Editorial.

The Television Group of the Midland Amateur Radio Society has put on the first large scale amateur TV demonstration this year, and a complete report from the Group secretary, Frank Rawle, appears on this page. The next large demonstration will be the 1960 Dagenham Town Show, and any members who can help are asked to contact Doug Wheeler at 56, Burlington Gardens, Chadwell Heath, Essex. The dates are the 2nd to 10th July.

The B.A.T.C. Convention this year will be held on Saturday, September 10th at the Conway Hall in London. Full details will be published in CQ-TV 45, but in the meantime please note the date, and if you have any suggestions send them to Don Reid.

Midlands News

The Television Group of the Midland Amateur Radio Society was much in evidence at the Birmingham and Midland Institute Annual Conversations held on January 12, 13, 14 and 15th this year. This event is a festival of the Arts and Sciences and we believe without parallel in the country. Many notabilities including the Lord Mayor were present to see the exhibits.

The T.V. Group put on their Staticon Camera distributing output at R.F. to four monitors placed at strategic positions throughout the building, the exhibit showing how a TV studio is laid out. The massive camera dolly was put to full use allowing full panning of the studio, illuminated by a dozen 500 watt floodlights. Within easy reach of the camera was the film projector and MARS 'Sputnik' symbol, used as an interval symbol, in addition to which the Flying Spot Scanner could be switched in to provide suitable advertising matter.

Much of the technical work was in the charge of Geoff Hill (G5DFL), Ernie Foulds (G5MKW/T) and Dennis Hodges (G5MKY/T), and the TV group secretary Frank Rawle, (G5FEZ) continuously sweated in front of the camera interviewing various victims. The programme consisted in the main of personal interviews before the camera with various exhibitors who were able to demonstrate with some of their exhibits what they were showing, and the three different focal lengths of the lenses showed them to advantage. The recently formed film unit showed a selection of films produced recently including the Trentham Gardens Mobile Rally 1959 and the Birmingham Show, 1959. It was generally agreed that Grant Dixon's colour gear would have been shown off to its best with some of the colour films.

It can well be imagined that a four day show of this type can be quite an effort but the many willing helpers in the group made the affair an acknowledged huge success and the group is looking forward to its next public show later in the year.

Frank J. Rawle. G5FEZ.

Cathode Ray Tube prices are down:

9" to 14" & 15"	24-10-0, 10-0d on old tube
16" & 17"	25-5-0, 15-0d on old tube
21"	26-5-0, 20-0d on old tube
24"	28-10-0, 25-0d on old tube
27"	210-10-0 50-0d on old tube

Delivery time about one week - orders to the editor CQ-TV please.

Narrow angle scan. coils - fit 5FF7 etc. Free to club members - full details from editor.

WHY PULSES ?

By M. Barlow

The word "pulse" is really short for "impulse", and this gives the clue as to why we use pulses. The electrical impulses can be used to switch other circuits on and off, and to initiate all sorts of subsequent actions. Sometimes one pulse is required to operate several different circuits simultaneously, in the same way that a system of wires and pulleys might operate several mechanisms from one lever, e.g. railway signals. In this case it is essential that the operative part of the pulse, usually the first or leading edge, arrives at all the driven circuits simultaneously. If very long cables are involved, special steps must be taken to overcome the finite propagation time along the cable. However let us assume that cable delays are negligible, and look at Figure 1.

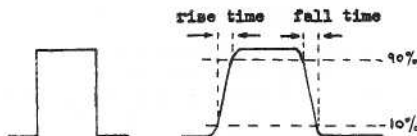


Fig.1: Ideal Pulse (L); practical reality (R).

Figure 1a shows a perfect rectangular pulse, having sharp transitions, infinitely steep edges and a flat top. Figure 1b shows the sort of pulse that can be produced electronically. Notice that the leading edge is not infinitely steep, that is to say that it takes a little time for the pulse to build up to its maximum value. If this pulse is to trigger two or more other circuits absolutely simultaneously, it is apparent that these circuits must trigger on exactly the same amplitude, or part, of the leading edge, or there will be a small time difference. Even with large pulses it would be very difficult to maintain the circuit bias, etc to this degree of accuracy, and so the only alternative is to make sure that the rise time of the pulse is small enough to be neglected. In TV work a rise time of 0.2 microseconds (405 line system) is enough, but for 525 and 625 0.1 microsecond is needed. Applying the formula $t_r = 2.2RC$, this gives the result that any pulse generator load resistor in kilohms times the load capacity in pF equals 100 for 405 lines and 50 for 525/625. If the average input capacity of any circuit is about 25pF, this means a load resistor of 4K or 2K only. Clearly a large current swing is needed in such small resistors to produce a pulse of more than 20 volts or so.

Pulse Generating Circuits

Most readers who come to TV by way of audio Hi-Fi amplifiers, amateur radio and the like will be familiar with the problems of obtaining undistorted, or linear, amplification. When dealing with pulses we are usually concerned with highly non-linear circuits, in which severe distortion is often highly desirable. Some new thinking is obviously needed.

Consider how the non-linear circuit develops from the simple linear amplifier. Figure 2 shows such amplifiers, and we all know that a small sine-wave input will appear amplified (and phase inverted) at the anode or collector. In the ideal case the output will be quite undistorted if the bias, etc is

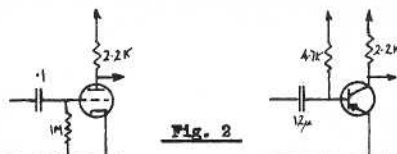


Fig. 2

correct. If now the amplitude of the input is increased, a point will be reached where the output waveform has its peaks clipped off. On one peak the amplifier is cut off, and on the other it saturates. The output (ideally) will appear as in Figure 5b.

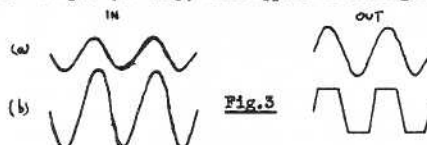


Fig.5

This is termed a square wave, as the positive and negative parts are of equal duration, i.e. the mark to space ratio is one. By altering the bias on the amplifier sufficiently, the mark/space ratio can be altered. Of course the edges of the pulse are not very steep, being sections of a sine wave. To make the edges steeper, we must either increase the input still further, or amplify the output and clip it again in another similar stage, as in Fig.4.

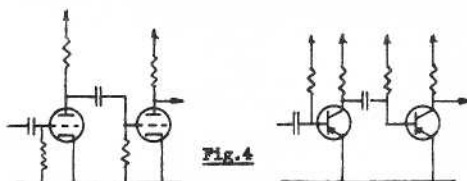


Fig.4

The greater the gains of the stages, the better will be the clipping action, and thus the steepness of the edges. To obtain the maximum gain, we can apply positive feedback, in which the output is fed back to the input in phase. See Figure 5.

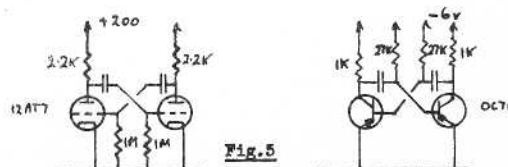
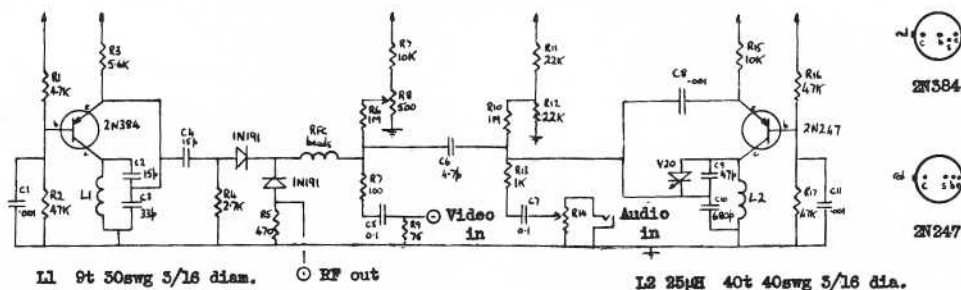


Fig.5

A TRANSISTORISED RF DISTRIBUTION UNIT

By M. Barlow.



As has been mentioned many times in CQ-TV, an RF distribution unit is one of the most useful units to have at the amateur TV station. It is really a low power transmitter tuned to an unused TV channel, into which local video and sound can be fed. By this means any TV set can quickly be put into action as a monitor. However the performance of the RF unit must be immaculate if the overall TV picture is not to be deteriorated.

This particular unit generates a carrier between 50 and 60Mc/s and modulates it with video. Added to the video is a 4.5Mc/s subcarrier FMD by the audio input. For 625 line systems, the subcarrier must be on 5.5Mc/s. For 405 lines AM sound is required, and this sound section is not usable. Also positive video modulation requires that the diode modulators be reversed, and also the bias voltage fed to R7.

A 2N384 drift transistor is used as a Colpitts oscillator. L1 with C2 and C3 tunes to the desired channel (US Chs 2-3-4), channel tuning being carried out by adjusting the slug in L1. The size of C3 determines the feedback and hence degree of oscillation. R1, R2, C1 bias the base. R3 drops some 10V at 2mA collector current. C2 and C3 should be high quality silvered mica capacitors to reduce thermal drift.

C4 couples the RF output to the 1N191 modulator diodes (any HF diodes will do). R4, R5 provide DC returns for the diodes which are biased by R7 & R8. The bias is set so that on a peak white signal about 10% of video carrier is radiated. Ferroxcube beads block the video carrier from getting lost in the video input circuit. R7 stops the audio subcarrier in the same way, and R6 blocks video and subcarrier from the bias chain.

A 2N247 transistor (not such a good HF as the 2N384) acts as a 4.5Mc/s Colpitts. V20 is a Pacific Semiconductors 20pF maximum "varicap" - a voltage operated capacitor. Bias is applied from R11 & R12, tuning being performed by the slug in L2. C8 blocks the emitter DC supply. R13 stops the 4.5Mc/s being lost in the audio input circuit, and R10 stops the audio getting lost in the bias chain. C6 is small enough to keep audio out of the video circuits.

The audio input varies the voltage across V20 and so FMs the subcarrier.

The unit requires a 22.5 volt supply; actually a +12-0-12 double supply can be used with the bases of the transistors taken to 0. A small mains supply can be built, or batteries used. The total drain is about 6mA.

To set up the unit, put the audio subcarrier on 4.5Mc/s with the aid of a communications receiver or by feeding into the Sound IF on a TV set; an audio input of about 50mV is required. Now feed the output of the whole unit into the antenna of the TV set, and tune L1 until the audio is heard through the TV set speaker. If video input (1 volt) is added, a picture should be seen on the screen. R8 is adjusted until there is just no cross-modulation buzz to be heard on the sound channel.

My particular unit fits an Eddystone diecast box 5"x 3" x 2" with room to spare. A tight-fitting lid is a must to prevent TVI. The modulator should be screened from the oscillators to prevent direct radiated pickup. The only critical components are the frequency determining ones, including R11 and R12. If readers wish to crystal control the oscillators, substitute the crystal for C8, and similarly for the video channel.

Appendix Transistor characteristics:

Type:	Mfr.	P _o	V _{CE}	I _c	f _{ab}	G _s
2N247 pnp	RCA	35mW	-35V	-10 β = 60	30Mc	3702Mc
2N384 pnp	RCA	120mW	-30V	-10 α = .98	100Mc	34

Equivalents: 2N384 = OC171 (Mullard)
2N247 = OC170 (Mullard)

REMINDER.... Have you paid your 1960 subscription yet????

COVER PHOTOGRAPH shows Pluff Plowman's recently completed AM-FM slow scan monitor.

SLOW SCAN TELEVISION

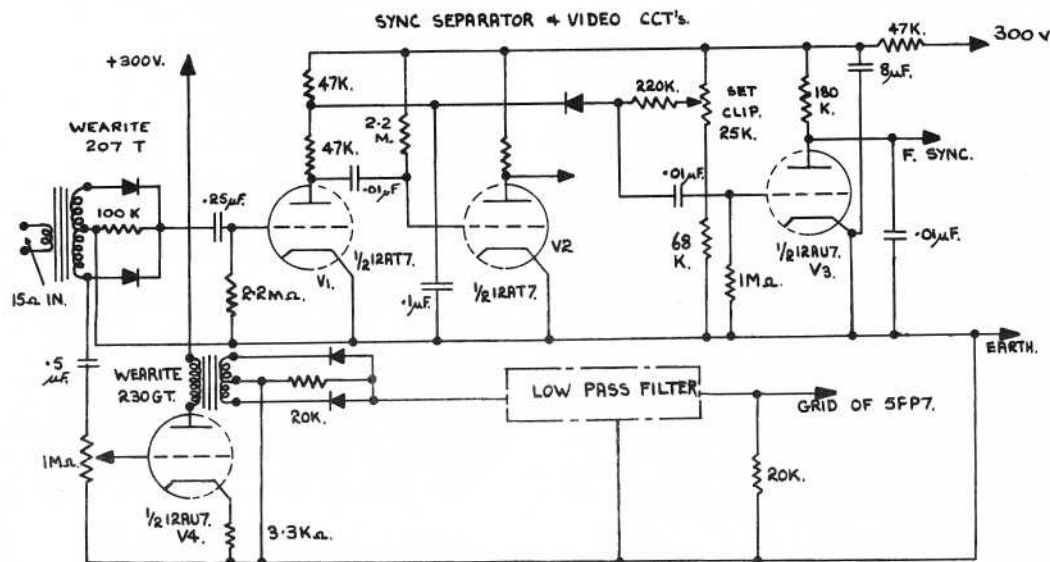
Some notes and comments from C. Grant Dixon

There have been a number of enquiries about slow-scan television circuits and the following is a short description of my own slow-scan monitor which is designed for the display of A.M. signals using negative modulation. Some experiments on slow-scan television were conducted by Bill Stapleton in Dublin, and Pluff Flowman in Yeovil some time ago but the article by Cop. Macdonald in 'QST' last year revived interest and resulted in the display at the Radio Hobbies Exhibition last year. Pluff Flowman is working on an F.M. system but has not yet reached the state of producing pictures. My own monitor is therefore designed to display pictures from Cop Macdonald's tapes, but sufficient space has been left to build an F.M. adaptor on to the chassis at a later date.

For the viewing tube a 5FP7 has been chosen as it enables a bright picture to be obtained with an EHT supply between 5 and 7 Kv. For simpler equipment a 5FP7, an electrostatic tube, can be used, and reference should be made to the original article in QST for August, and September 1958 for suitable scanning circuits. With a magnetic tube there are two problems in the scanning circuits.. line linearity, and coupling the vertical scanning generators directly to the coils. As the line frequency is 20 to 25 cycles per sec. the circuit is similar to the normal field time-base, but the lower frequency demands an output

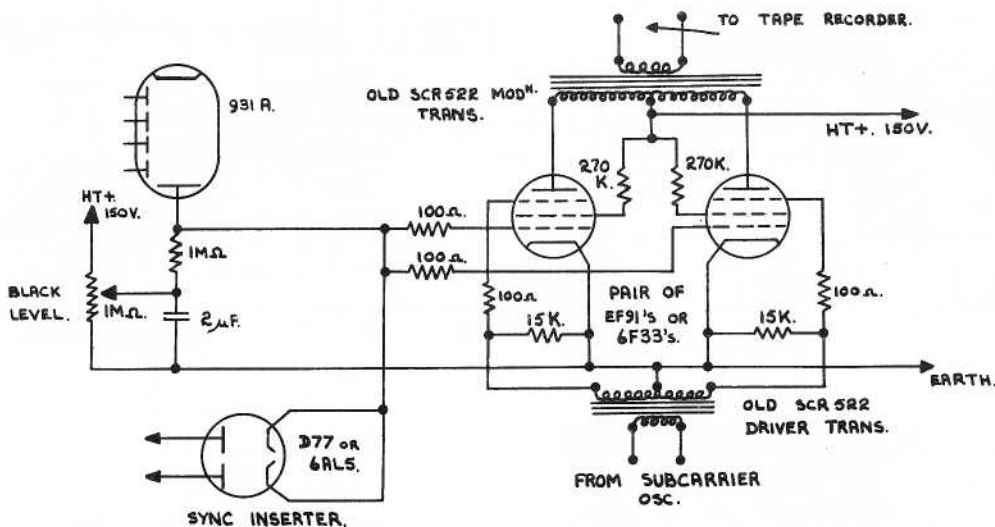
transformer with very high inductance. To help in this respect, the primary is isolated from the cathode current of the output valve, which would tend to saturate the core, by a 16 mfd capacitor. The values quoted are the result of patient trial and error and suit the particular coils and transformer used here; other people may find that different values would give better results. A 400 cycle square wave fed into the CRT grid gives vertical bars which enable adjustments to be made and the effect on linearity to be observed on the screen.

The field scanning is performed by a standard thyratron timebase which is DC coupled to a 6V6. A second 6V6 provides backing off current to enable the scan to start at the top of the screen. The scan coils are HIGH RESISTANCE ones and should be 750 ohms at least, preferably double this figure. If the resistance is higher then it may be possible to increase the cathode loads, but care must be taken that the DC flowing through the first cathode load, the coils and the second 6V6 does not hold the first 6V6 in a cut off condition for the first part of the scan. As the current consumed by the field timebase varies considerably from top to bottom of the picture it is imperative that the power pack has a low impedance. A regulated H.T. line is almost essential; even several hundred mfd will not cope with a 5 or 6 second variation! It might



Another circuit from Manchester - Gordon Sharpley, G5LEB/T, has built his unit to work from a photo multiplier type cell - type 931a - the unit produces an output similar to Brian Green's unit - a negative modulation on a subcarrier in the 5Kc/s region. Sufficient signal can be obtained from the 931a to drive the balanced modulator directly.

For this order of output the cell is run with 800 volts across it. To check the correct operation of the balanced modulator, remove the subcarrier input and check that there is no video at the output. If unbalance is suspected a 0.5 Meg pot between the screen grids of the modulator valves with the slider taken to HT, will give some measure of control.



"WHY PULSES?" continued

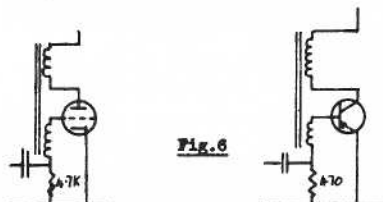


Fig. 6

The effect of the feedback is to ensure that the changeovers are extremely fast, and that one stage is out-off whenever the other is saturated. By using low values of load resistor, rise times of 0.1 to 0.2 microsecond can be obtained. Of course as is usual with positive feedback, oscillation can

occur, and in fact the circuits of Fig. 5 are those of standard multivibrator oscillators. Another way of applying positive feedback is by means of an output transformer suitably connected, as in Fig. 6. This circuit is the common blocking oscillator.

The circuits given are not necessarily the best for any particular application, but further information is given in the literature.

References:

- Fundamentals. Reid, CQ-TV59.
- Waveform Generation. Amos and Birkinshaw, Vol. iii
- BBC TV eng. series, publ. Iliffe.
- Waveforms. MIT Radar series, Vol. 18.
- Junction Transistor Trigger Circuits. Radio Electronics - Electronics August 56 p57.
- Electronic Eng. Jan, Feb, March 1957.
- Mullard Tech. Comm. 3/21 Feb 1957.

Dennis Wheaton VK2AWW/T finds he is only 5 miles away from a new member, F.J. Caton, VK2ABQ/T in New South Wales, and has hopes of a 288 Mc/s contact. He is in close touch with Bill Brownbill, VK3BU/T; Bill has been busy recently, having organised the first Australian amateur TV convention. It seems to have been a great success - congratulations OM, and we look forward to hearing more news of Australian activity in the future.

Charlie Rann VK3AAK/T has paid a visit to Eric Cornelius VK6EC/T, in Perth; Eric has been experimenting with subjective colour on his closed circuit system. Charlie reports that colours can become apparent even on a P7 phosphor. B.M. Tarlton ZL3IH (Christchurch, N.Z.) is planning to use a QQE06/40 in his vision transmitter on 430 Mc/s.; progress is slow but sure. Frank Dickinson (Rome) has drawn our attention to a useful book omitted from the reading list in no. 40 - "Closed Circuit & Industrial TV" by E.M. Noll published by Macmillan, New York. Price about 30/-.

Rodney Randall (Northwood, Middlesex) has been playing over the Club lecture tapes (don't forget, these can be borrowed from the Chairman). His main interest is in colour TV; he is hoping to pick up the BBC test transmissions by converting the NTSC signal to a frame sequential colour signal. He is anxious to obtain a 2.65 Mc/s crystal, and a delay line - can anyone help? Graham Hill (Dover) is building a monoscope camera, and completing his 14" video monitor. Graham ran into trouble with jitter in the BATC sync generator, so has designed a new one based on the counter circuit in CQ-TV 30. He is using 19" panels, but requires a rack. Alan Sherman (Brentwood) and Adrian Ball G3M2Q/T (Hutton) are both working on flying spot scanners, though Adrian temporarily lapsed into the realms of stereo hi-fi!

John Watts (Somerset) reports that he has been thinking about colour TV, and is in touch with Grant Dixon. (Remember - the Chairman co-ordinates all BATC work on colour TV - so drop him a line if you have any news or problems.) A glance at the change of address list will reveal that three members are helping set up the TV service in Nigeria - B.B. Ajayi, M. Heffernan, and Jack Terry.

Clive Jones (Southall) would like to contact anyone who has used an optical system for scanning 35 mm negs and transparencies. M.J.A. Bryett has moved to St. Ives, and puts in a plea for a 931A. He is building a FSS and is short of the photocell.

Grant Dixon reports that a 5FP7 with an orange filter gives very fine results as a slow scan TV monitor. Pluff Plowman G3AST is hard at work on his new de luxe slow scan monitor, to accept either FM or AM inputs. He successfully received pictures from WA2BCW on 20th December, 1959 at 3.20 pm GMT. Gordon Sharpley, G3LEE (Manchester) has also built a slow scan system. He prefers the AM system, and has tried 3FP7s, one as scanner and the other as monitor. Would other members who are constructing slow scan equipment please keep G3AST informed of their progress, so that he can co-ordinate slow scan activity.

New member K. Miller (Edinburgh) possesses a 6" reflecting telescope, and is considering using a staticon camera in conjunction with it - has any other member tried this? Steve Harris (Bournemouth) has completed the sync generator and the vision-sync-blanking mixer shown in nos. 28 and 32, and is now testing them. Eric Lawley (Chelmsford) hasn't much time for ATV these days; his company has sent him on a world tour demonstrating TV gear. Rome and Delhi are among the places he is visiting. Oliver Wolverson (Birmingham) has been receiving a guiding hand from George Flanner, and is looking forward to building a vidicon camera with his help.

Deryck Aldridge (Newcastle) has finished a 9" monitor, to accept Club standard signals of 1V comp. video - and the next item on his programme is a flying spot scanner. P. Bircher (Barrow-in-Furness) has built the scanning section of his FSS, and checked that it works satisfactorily.

Harry Burton ZL2APC (Eastbourne, N.Z.) has a 5FP7 FSS in action, and a 45 valve sync generator of his own design. His transmitter uses a QQE06/40 which operates as a power tripler, and is screen modulated by a shunt regulated amplifier. (See BBC TV Engineering Vol.4 for a description of shunt regulated stages).

Ft/Sgt Dave Vierod reports much re-organisation of the RAF Amateur TV Society at Locking, Somerset. He is now the Hon. Sec. The Society are starting a training scheme to encourage new members.

Bill Hipwell's colour bar generator was seen in action at the Radio Hobbies Exhibit - the bars were displayed on John Ware's receiver, which had also shown colour pictures from the BBC. Thanks also to the other exhibitors on the BATC stand - John Cronk G3MEO/T, Pluff Plowman and Mike Cox; to all those who helped on the stand; and to Bernard Wright (Brentwood) who produced a large sized Club badge for the stand.

The groups in Essex are now planning for our stand at the Dagenham Town Show this summer ; any members who would like to help should contact Doug Wheele. And it is certain that plenty of help will be needed at the Show, which lasts for two days, Saturday and Sunday.

Gordon Sharples, G3LEE, Manchester, is planning to bring some of his gear along to the Convention. He has been exchanging tapes of slow scan TV with Grant Dixon, and encouraging results have been obtained.

Richard Scammell, Highbridge, Somerset, is having some trouble with his sync gen.- can anyone in the district give him a helping hand ? Lewis Duncan, West Fife, has completed his oscilloscope, and the next item is a flying spot scanner. He has a cavity magnetron CV1481 with magnet and wave guides - free to a BATC member - but pay for post. Victor Cedar, who has moved to a new QTH in Upper Norwood, has some MW2-6 projection tubes and CV90 valves for sale - price 5/- each, plus postage. He recommends the EMI GRT R6092 at 17/6d from Smiths of Edgware Rd., as excellent camera vidfinder tubes.

Mike Bryett, who has moved to Bluntisham, Hunts., is in close touch with the Cambridge group, and has received plenty of encouragement from Mike Soames and Ian Waters. Arthur Critchley has been called up for National Service with the RAF - don't forget the RAF Amateur TV Society at RAF Locking, om - and may be the time go quickly !

Tom Douglas sends news that the Midlands group took part in the Birmingham & Midlands Conversazione in February, and had a nice little studio set for interviewing and telefilm distribution. Brian Robinson, Scunthorpe, has started work on a flying spot scanner ; he has a 5FP7, but no 931A yet. Can anyone assist here ? Brian has built a crystal controlled 430 Mc/s TX, consisting of EF91, 8 Mc/s tripler, 12AT7 tripler, 5763 doubler, and 832A tripler. Is anyone in the Scunthorpe district able to receive 70 cm transmissions ? John Byrne, Malvern, has almost completed a 70 cm converter, and hopes to radiate video later this year. He is trying to stir up local enthusiasm, and form a group in Malvern.

Dick Irwin, Middlesborough, is keen on slow scan TV ; he owns a Brenell tape recorder, and other recording gear, and would be pleased to exchange tape letters on the subject. Tony Errington (Southsea, Hants.) can resolve a reasonable picture with his vidicon channel, but has had troubles with his VSB mixer. Try the circuit given by G3KOK/T in CQ-TV 38 - it's guaranteed good!

Grant Dixon has promised the first item for display at the Convention - a complete slow scan system, giving a bright picture on a 5FP7. Grant is also at work on his vidicon camera, and has already wound the coils. Speaking of the Convention (10th Sept.) - what are YOU bringing for display ?

Surg.Lt.Comm.(D) G.J.Boyd sends news of the TV system aboard the Ark Royal ; 75 sets are supplied from a ring main into which can be fed BBC or ITA signals, and more important, programmes originating from the studio in the ship.

A.N.Venkata Raman, VU2TD, is over in this country until the spring, then he returns home to Bangalore, India. A small experimental station in Delhi, viewed by the owners of about 30 receivers, is the only TV tx in India at present. VU2TD intends to set up a station in Bangalore, and encourage local amateur activity - good luck, om. He has acquired a vidicon to take home with him for a start. He is, by the way, our ONLY member in the continent of Asia !

John Jull, G3MHZ/T, an ex-member of the Cambridge group who is now known as 23574546 Jull J.A., writes with some news from Cyprus. He will be back in England by the end of June, and mentions the lack of amateur TV activity on the island. John is going to discuss with Roger Oldfield, the idea of a slow scan TV link from England to Bermuda ! In Bermuda, Roger really is isolated as far as 70 cm is concerned - so we look forward to hearing news of the slow scan project.

Bryan Timms G3MLE has now moved to Cambridge to take up a new job there, and is of course joining the Cambridge group, which has almost simultaneously lost Arthur Critchley. Bryan and Pete Bendall, G3NEU/T hope to start organising G8PY in the near future, though unhappily, Matilda now seems a total write-off.

Our best wishes for a speedy recovery go to Adrian Ball, G3MZQ/T, Brentwood Essex, who has been in hospital recently. Brentwood group held their Film Show on 20th Jan. There was an attendance of 35, including members of the Chelmsford and S.W.Essex groups; and local RSGB members ; among the films shown was the BATC Panorama item. Needless to say, the weather was freezing, and thick snow met the guests as they left the hall !

We learn from M.E.Slater, G3NML/T, that Ron Bassett put on a very good show, using 5 monitors, in Southampton last June (let's have some up to date news now, Ron !), and John Denny is now G3NTE/T. G3NML/T was pleased to be put in touch with local members - don't forget, if you want to discover YOUR nearest BATC members, the Hon. Sec. now has his geographical index in action.

NEW MEMBERS

H.M.S. Ark Royal, c/o G.P.O., London.
(Correspondence to : Surgeon Lt.Comm(D)
G.J. Boyd, R.N.)

J.Byrne, G2AFD, Caxton Cottage, Wells Road,
Malvern

P. Bircher, 15 Dalton Lane, Hawcoat,
Barrow-in-Furness, Lancs.

D.W.A.Burridge, 11 Forest Road, Slade
Green, Erith, Kent.

F. Dickinson, 208 Via Giolitti, Rome 413,
Italy.

G.H. Dudley, 228 Long Shoot, Nuneaton,
Warwickshire.

C.T.Davies, 19 Broadmead, Penllwyn,
Pontllanfraith, Monmouthshire.

English Electric Apprentices Association,
The Radio Club, Lichfield House, Stafford.
(Hon.Sec.: N.D. Pearson)

R. Geere, 314 St. Pauls Road, Highbury, N.1.

D.L. Gibson, G3JDG, 5 Edward Close,
St. Albans, Herts.

S. Grejcar, 9 Beech Drive, Borehamwood,
Herts.

J. Gudonnia, 1014 Melon Street, Philadelphia,
23, Pennsylvania, U.S.A.

A. Evans, 99 Cherry Tree Lane, Great Moor,
Stockport, Cheshire.

Gruppo Radiotecnico, Via Mercato 5, Milano,
Italy. Hon. Sec.: A.Bordieri, ILVT.

R.J. Harry, GW3NRT/T, "Elferdan", The Common,
Whitchurch, Cardiff.

P.R. Horne, 62 St. Philips Road,
Newmarket, Suffolk.

S.L. Hughes, 34 Orchard Crescent, Cherry
Hinton, Cambridge.

G.B. Marston, G3JEG, Eilansgate House,
Hexham, Northumberland.

J.N.T. Murphy, 13 Chesterton Grove,
Cirencester, Gloucestershire.

K. Miller, 13 St. Ninians Road, Corstorphine,
Edinburgh.

W.O'Riordan, 87 Warley Hill, Brentwood, Essex.

R.F. Orme, 33 Aldersley Avenue, Tettenhall,
Wolverhampton, Staffs.

B.G. Pilcher, 22 Victoria Street, Mile End,
Portsmouth, Hants.

M. Pittam, G3NWA/T, Rectory Farm,
Calverton, Wolverton, Bucks.

C.Padgett, 20 Wolsey Road, Newark, Notts.

R.E.Pittet, Kitty Kiellandenei 21, Aul6s,
Sandvika, Norway.

M.E. Slater, G3NML/T, 173 Broadlands Road,
Swaythling, Southampton, Hants.

D.G. Small, 9 South Gray Street, Edinburgh, 9.

N.V. Smith, 27 Westerham Avenue, Edmonton,
London, N.9.

List of New Members - continued

J. Stace, G3CCH, 38 Skippingdale Road,
Scunthorpe, Lincs.

O.A.G. Wolverson, 39 Cranbrook Road,
Handsworth, Birmingham, 21.

A.P. Young, "Hillside Chalet", Heathbourne
Road, Bushey, Herts.

A.N.Venkata Raman, VU2TD, Elec.Research
& Dev. Est., High Grounds,
Bangalore, India.

P. Sado, 13 Loudoun Road, London, N.W.8.

P.A. Sharp, G3NNH, 62 Dornock Avenue,
Sherwood, Nottingham.

M. Smith, 18 Sydney Terrace, Bowbridge
Road, Newark, Notts.

M.E.Theaker, 22 Clifton Park Road,
Rhyl, Flintshire.

R. Villiers, 8 Syr Davids Avenue, Cardiff.

J.D.Watson, 9 Quarry Mount, Delph Lane,
Leeds, 6.

CHANGES OF ADDRESS

B.N.Bartlett, The Rectory, Llanllowell,
Usk, Monmouthshire.

C.Bogod, "Dickens", 26 Forrest Road,
Penarth, Glamorgan.

Flt.Lt.M.J.A.Bryett, Nobles Farm,
Bluntisham, Huntingdonshire.

V.Cedar, 2a Convent Hill, Upper Norwood,
London, S.E.19.

B.B. Ajayi, 63 Olonode Street, Lagos,
Nigeria.

M.J.A. Bryett, Westgarth, St.Ives, Hunts.

M.W. Heffernan, W.Nigerian Radiovision
Service, TV House, P.O. Box 1460,
Ibadan, Nigeria.

W.E.G. Smith, 115 Thorpe Road,
Peterborough, Northants.

J.B.Terry, C/o W. Africa Region Office,
Marconi's, Private Mailbag 1024,
Apapa, Lagos, Nigeria.

D.G.Wheaton, 35 Sixth Avenue, Condell,
Park, New South Wales, Australia.

B. Wright 19 Wainwright Avenue, Hutton, Essex.

P. Bendall G3NBU/T 107 Mawson Road Cambridge.

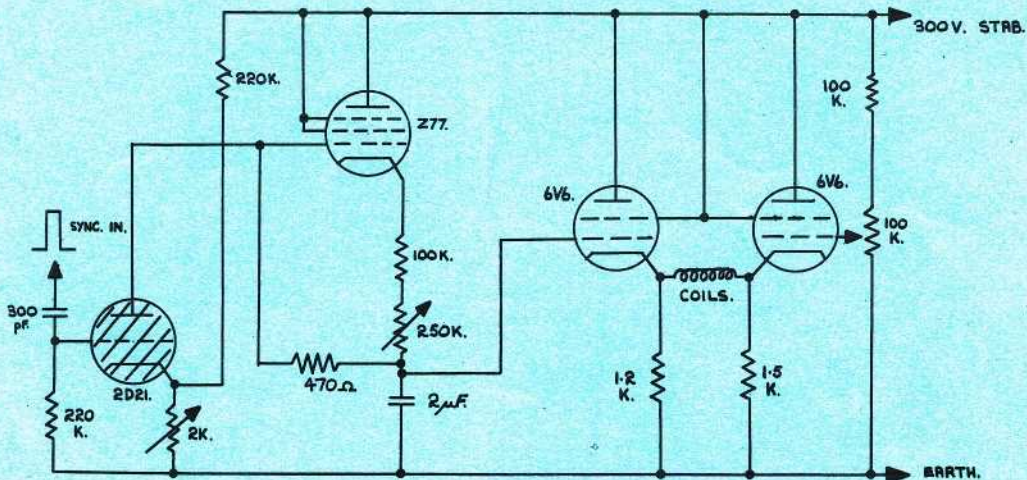
B. Partridge, 206 Upper Bridge Road, Chelmsford.

M. Chaney, 94 Arbour Lane, Chelmsford.

K.J.Field, 56 Spring Lane, Olney, Bucks.

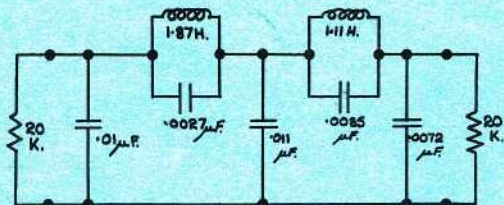
M.W.S.Barlow, Chestnut Avenue, Pierrefonds,
P.Q. Canada.

FIELD TIME BASE.



These two drawings complete the article on slow scan television by Grant Dixon.

LOW PASS FILTER.



FLAT TO 1402 C/S.

35 dB DOWN AT 1605 C/S.